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EXAMINER

CANTELMO, GREGG

ART UNIT

PAPER NUMBER

1745

DATE MAILED: 01/29/2003

9

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/721,578

Applicant(s)

SKOTHEIM ET AL.

Examiner

Gregg Cantelmo

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 November 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Response to Amendment

1. In response to the amendment received November 18, 2002:
 - a. The specification objections have been withdrawn;
 - b. The 112 rejection is withdrawn;
 - c. The prior art rejections have been withdrawn;
 - d. The double patenting rejections stand.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claim 14 is rejected under 35 U.S.C. 102(b) as being anticipated by U.S. patent No. 5,824,434 (Kawakami).

Kawakami discloses an anode of an electrochemical cell, wherein said anode comprises: a first anode active layer comprising lithium metal (col. 2, ll. 58-60) and a multi-layer structure in contact with a surface of the first anode active layer, wherein said multi-layer structure comprises 3 or more layers (col. 3, ll. 19-23), wherein at least one of said three or more layers comprises a single ion conducting layer and at least one of said three or more layers comprises a polymer layer (col. 28, ll. 5-11). The

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stacked structure recited in col. 28, ll. 1-11 includes a conductor layer, semiconductor layer and insulating layer stacked by a vapor deposition method. Thus this constitutes a 3-layered structure. Each of these layers conducts lithium ions and is single ion conductors. The insulating layer is a polymer material (col. 27, ll. 5-10 as applied to claim 14).

Response to Arguments

4. Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1, 3, 4, 10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawakami in view of U.S. patent No. 5,529,860 (Skotheim).

Kawakami discloses an electrochemical cell comprising: a cathode or positive pole (col. 18, ll. 28-30), an anode or negative pole (col. 7, ll. 24-29) a non-aqueous electrolyte interposed between the cathode and anode (col. 16, ll. 58-60 and Fig. 8) wherein said anode comprises: a first anode active layer comprising lithium metal (col. 2, ll. 58-60) and a multi-layer structure in contact with a surface of the first anode active

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layer, wherein said multi-layer structure comprises 3 or more layers (col. 3, ll. 19-23), wherein at least one of said three or more layers comprises a single ion conducting layer and at least one of said three or more layers comprises a polymer layer (col. 28, ll. 5-11). The stacked structure recited in col. 28, ll. 1-11 includes a conductor layer, semiconductor layer and insulating layer stacked by a vapor deposition method. Thus this constitutes a 3-layered structure. Each of these layers conducts lithium ions and is single ion conductors. The insulating layer is a polymer material (col. 27, ll. 5-10 as applied to claim 1).

The thickness of the structure can vary depending on the make-up of the structure and can be 10 microns or less such as 1 micron (col. 28, ll. 12-23 as applied to claims 3 and 4).

The organic solvent of the electrolyte provides for a liquid electrolyte (col. 16, ll. 58-60 as applied to claim 10).

The anode comprises a current collector substrate 100 in contact with a first surface of the anode active layer on the side opposite to the multi-layered structure (Fig. 1 as applied to claim 12).

The difference between instant claim 1 and Kawakami is that Kawakami does not teach or suggest the cathode having an electroactive sulfur-containing compound therein.

Skotheim discloses of cathodes having electroactive sulfur (abstract).

The motivation for using a cathode having an electroactive sulfur-containing compound therein is that it improves the storage capacity of the electrochemical cell at ambient and sub-ambient temperatures (col. 1, ll. 10-16).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Kawakami by using a cathode having an electroactive sulfur-containing compound therein since it would have improved the storage capacity of the electrochemical cell at ambient and sub-ambient temperatures.

7. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawakami in view of Skotheim as applied to claims 1, 3, 4, 10 and 12 above, and further in view of U.S. patent No. 5,569,520 (Bates).

The difference not yet discussed is of the thickness of the anode active layer (claim 2).

Kawakami is drawn to forming thin film batteries (col. 3, ll. 46-55). Bates is further drawn to forming thin film batteries wherein the anode active film is 9 microns thick (col. 5, ll. 7-17 and col. 2, ll. 20-25).

Selection of an anode foil of a thickness from 2-100 microns is known in the art as taught by Bates. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges is critical. In re Boesche, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

The motivation for selecting an anode thickness from 2-100 microns is that it would have provided an optimal active layer thickness with reduced electrical resistance.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Kawakami by optimizing the anode active film thickness to be 2 to 100 microns as shown by Bates since it would have provided an optimal active layer thickness with reduced electrical resistance.

8. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawakami in view of Skotheim as applied to claims 1, 3, 4, 10 and 12 above, and further in view of JP 09-279357 (JP '357).

The differences not yet discussed are providing a metal alloy layer to the electrochemical cell (claim 6) or of the multi-layer structure comprising four or more layers (claim 5).

With respect to providing a metal alloy layer (claim 6):

JP '357 discloses providing a metal layer on the surface of an anode in a lithium battery (abstract). One of the metal materials is tin.

The motivation for coating the anode active material with a metal or metal alloy such as tin, is that it suppresses the reaction between the active material in the electrode and the electrolyte, suppress the decomposition of the electrolyte and improve cycle characteristics (abstract).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Kawakami by coating the electrode with a metal layer since it would have suppressed the reaction between the active material in the electrode and the electrolyte, suppressed the decomposition of the electrolyte and improved cycle characteristics.

With respect to the multi-layer structure comprising four or more layers (claim 5):

As discussed above Kawakami teaches of at two or more layers in the structure and in the stacked arrangement, three layers.

Adding a metal layer on top of the anode as taught by JP '357 suppresses the reaction between the active material in the electrode and the electrolyte, suppress the decomposition of the electrolyte and improve cycle characteristics.

The result of which provides a total of four layers formed on and in contact with the anode active layer.

9. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawakami in view of Skotheim as applied to claims 1, 3, 4, 10 and 12 above, and further in view of U.S. patent No. 5,314,765 (Bates '765).

The difference not yet discussed is of the protective layers comprising LiPON (claims 7 and 8).

Bates '765 teaches that single ion conducting layers (such as LiPON) can be used in a lithium battery as a protective or barrier layer on the anode active layer (abstract).

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The motivation for using LiPON as an ion conducting layer in a protective barrier arrangement disposed on the anode active layer is that it separates the lithium anode and the electrolyte. Further, by coating the lithium anode with this material lay-up, the life of the battery is lengthened and the performance of the battery is enhanced (abstract).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Bates '765 by providing a LiPON protective layer as taught by Bates '765 since it would have separated the lithium anode and the electrolyte, lengthened the life of the battery and enhanced the performance of the battery.

10. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawakami in view of Skotheim as applied to claims 1, 3, 4, 10 and 12 above, and further in view of U.S. patent No. 6,277,514 (Ying).

The difference not yet discussed is of the polymer layer comprising one or more acrylate monomers selected from the group consisting of alkyl acrylates, glycol acrylates and polyglycol acrylates.

Kawakami polymerizes various polymer materials as part of the protective layering atop the anode active material (col. 8, ll. 39-45). Ying discloses that it is known to employ various acrylates in a protective coating for anodes (col. 13 ll. 3-10 and prior art claim 8). The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v.*

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Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945) See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

The motivation for using acrylates such as alkyl acrylates, glycol acrylates and polyglycol acrylates is that it provides a polymer layer having barrier properties with improved lithium ion conductivity.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Kawakami by using acrylates such as alkyl acrylates, glycol acrylates and polyglycol acrylates since it would have provided a polymer layer having barrier properties with improved lithium ion conductivity. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945) See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

11. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawakami in view of Skotheim as applied to claims 1, 3, 4, 10 and 12 above, and further in view of JP '357.

The difference not yet discussed is of providing an intermediate layer (either a temporary protective metal layer or plasma CO₂ treatment layer) between the anode active layer and protective layer.

JP '357 discloses providing a metal layer on the surface of an anode in a lithium battery (abstract).

Since the function of the temporary metal layer is unclear with respect to the claim limitations, the examiner has not given patentable weight to this term. JP '357 teaches of some of the same metal materials and absent cleared claim language drawn to the term "temporary" is also held to be a "temporary" protective metal. In the instant case, some of the metal materials in the genus of JP '357 are the same as those exemplified in the instant application as temporary protective metal layers, the properties of the prior art metal layer will be the same as those of the temporary protective metal materials of the instant application.

The motivation for coating the anode active material with a metal or metal alloy such as tin, is that it suppresses the reaction between the active material in the electrode and the electrolyte, suppress the decomposition of the electrolyte and improve cycle characteristics.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Kawakami by coating the electrode with a metal layer since it would have suppressed the reaction between the active material in the electrode and the electrolyte, suppressed the decomposition of the electrolyte and improved cycle characteristics.

12. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawakami in view of Skotheim as applied to claims 1, 3, 4, 10 and 12 above, and further in view of U.S. patent No. 5,387,479 (Koksang).

The difference not yet discussed is the particulars of the substrate.

Kawakami discloses that the collector, i.e. substrate, is made of fiber, porous or mesh-like carbon, stainless steel, titanium, nickel, copper, platinum or gold (col. 21, ll. 29-31).

Koksang teaches that it is known to configure metal current collectors as foils (col. 2, ll. 31-35).

The motivation for using a foil substrate for the current collector is that it reduces the weight of the battery.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Kawakami by using a metal foil substrate for the current collector since it would have reduced the weight of the battery.

13. Claim 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawakami in view of JP 09-279357 (JP '357).

The teachings of claim 14 have been discussed above and are incorporated herein.

The difference between instant claim 15 and Kawakami is that Kawakami does not disclose of the multi-layer structure comprising four or more layers (claim 5).

JP '357 discloses providing a metal layer on the surface of an anode in a lithium battery (abstract). One of the metal materials is tin.

The motivation for coating the anode active material with a metal or metal alloy such as tin, is that it suppresses the reaction between the active material in the

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electrode and the electrolyte, suppress the decomposition of the electrolyte and improve cycle characteristics (abstract).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Kawakami by coating the electrode with a metal layer since it would have suppressed the reaction between the active material in the electrode and the electrolyte, suppressed the decomposition of the electrolyte and improved cycle characteristics.

As discussed above Kawakami teaches of at two or more layers in the structure and in the stacked arrangement, three layers.

Adding a metal layer on top of the anode as taught by JP '357 suppresses the reaction between the active material in the electrode and the electrolyte, suppress the decomposition of the electrolyte and improve cycle characteristics.

The result of which provides a total of four layers formed on and in contact with the anode active layer.

Response to Arguments

14. Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

Double Patenting

15. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11

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F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

16. Claims 1, 2, 5-8 and 10-15 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 9, 11, 37, 38, 43, 45-50 and 57 of copending Application No. 09/721,519 (USAPP '519).

Although the conflicting claims are not identical, they are not patentably distinct from each other.

USAPP '519 claims a cathode comprising a cathode active material which comprises an electroactive-sulfur containing material (claims 37 and 57); an anode (claim 37); a non-aqueous electrolyte interposed between said anode and cathode (claim 37); wherein said anode comprises an anode active layer, which the anode active layer comprises: a first layer comprising lithium metal (claim 37); an a multilayer structure comprising: an ion conducting layer comprising a glass selected from the group specified in claim 47 identical to the group in instant claim 7 (claims 46 and 47) a polymer layer (claims 48-50 as applied to claim 1) and a temporary protective metal (claim 37 as applied to claim 1).

The thickness of the first anode active layer is 2 to 100 microns (claim 41 as applied to claim 2).

The multilayer structure as claimed above comprises a first layer of lithium and three additional layers of a metal, ion conducting layer and polymer layer. Thus the structure comprises four or more layers (as applied to claim 5).

The temporary protective metal layer includes Zn, Mg, Sn and Al (claim 38 as applied to claim 6).

The ion conducting layer genus is identical to the instant claims (claims 46 and 47 as applied to claims 7 and 8).

The non-aqueous electrolyte is a liquid electrolyte (claim 54 as applied to claim 10).

The metal layer is a temporary protective metal which is in contact with the first layer comprising lithium and therefore is an intermediate layer between the first layer and the additional ion conducting and polymer layers (claims 37 and 46-50 as applied to claim 11).

The anode further comprises a substrate in contact with a surface of said first anode active layer on the side opposite to the additional layers (claim 43 as applied to claim 12).

The substrate is selected from the same genus in both the instant claims and claims of USAPP '519 (claim 45 as applied to instant claim 13)

USAPP '519 claims an anode of an electrochemical cell comprising a first anode active layer of lithium (claim 1) and three additional layers of a metal (claim 1), ion-conducting layer (claim 9) and polymer layer (claim 11 as applied to claim 14). Thus the

structure comprises three or more layers and further four or more layers (as applied to claims 14 and 15).

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

17. Claims 14 and 15 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 and 6 of copending Application No. 09/864,890 (USAPP '890). Although the conflicting claims are not identical, they are not patentably distinct from each other.

USAPP '890 claims a method of making an anode. The method resulting in a product which obviates the instant claimed invention. More clearly:

The process of claim 1 of USAPP '890 forms an anode for an electrochemical cell comprising: a first anode active layer comprising lithium metal, a polymer layer and a single ion conducting layer. Thus generating an anode comprising three or more layers (claim 1 as applied to claim 14).

An additional metal layer is interposed in the multilayer structure thereby providing a fourth layer (claim 6 as applied to claim 15).

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

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Response to Arguments

18. Applicant has not rebutted the double patenting rejections nor has Applicant submitted terminal disclaimers in response to these rejections. Therefore these rejections stand.

Conclusion

19. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Although USPAT 5,462,566 is cited as an X reference in the international search report, this reference does not appear to teach of the multilayer structure recited in either claim 1 or 15. The Examiner does consider this reference to be anticipatory of the claims identified in the search report and has not been applied in a 102 rejection.

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregg Cantelmo whose telephone number is (703) 305-0635.

The examiner can normally be reached on Monday through Thursday from 8:00 a.m. to 5:30 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan, can be reached on (703) 308-2383.

FAX communications should be sent to the appropriate FAX number: (703) 872-9311 for After Final Responses only; (703) 872-9310 for all other responses. FAXES received after 4 p.m. will not be processed until the following business day. Any inquiry

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of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Gregg Cantelmo
Patent Examiner
Art Unit 1745


Patrick Ryan
Supervisory Patent Examiner
Technology Center 1700

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January 25, 2003